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The effects of technology on achievement in a cooperative learning environment

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THE EFFECTS OF TECHNOLOGY ON ACHIEVEMENT IN A COOPERATIVE LEARNING ENVIRONMENT

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By

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This is dedicated to Jesus Christ, my personal Lord and Savior. "I can do everything through Him who gives me strength." Philippians 4:13

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CHAPTER I

Introduction

Cooperative learning, a heterogeneous group of students working together to achieve a mutual goal (Tateyama-Sniezek, 1990), is one of the most extensively evaluated instructional innovations used today (Slavin, 1995). Studies have shown that using cooperative learning is an effective tool for increasing the achievement of students (Slavin, 1995, 1996; Repman, 1993; and Shachar and Sharan, 1994). Based on the research there are many benefits to using cooperative learning. In a two-year study, Stevens and Slavin (1995) found that a cooperative learning environment provided more meaningful interactions between students and led to better peer relations compared to a traditional classroom environment. In the same study, it was found that cooperative learning had a positive effect on both mainstreamed students and gifted students.

In addition to cooperative learning, another classroom strategy that has proven to be successful is the use of technology. A 1988 survey conducted of approximately 8,000 teachers and principals found that the significant benefits of using computers are student motivation, student cooperation and independence, opportunities to develop higher-order thinking skills, and mastery of basic skills (Becker, 1988). Using computers in the classroom has shown to increase student motivation and allow for more attention to be paid to lower-achieving students.

Many of the studies that look at the effect of computer-based instruction on student achievement compare students using a computer cooperatively to students using the computer individually (Johnson, Johnson, and Stanne, 1986; Chernick, 1990; and Hooper, Temiyakarn, and Williams, 1993). These studies show that student achievement is increased when students work cooperatively. Research has also shown that when compared to traditional instruction, students using computer-based instruction without cooperative learning demonstrate equal or

better achievement (Hasselbring, 1986). Very little, if any research has been done that compares cooperative learning without technology to cooperative learning with technology.

Problem Statement

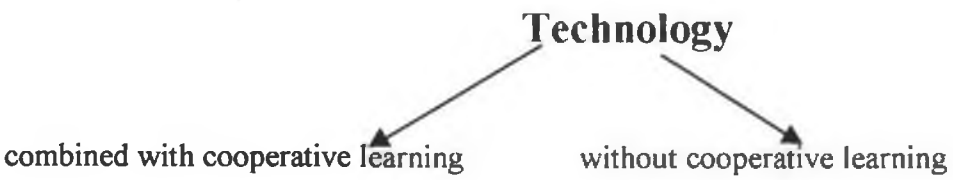
In light of the positive effect that cooperative learning and computer-based instruction have on student achievement, there is a need look at the effect these methods have on student achievement when they are combined.

Purpose of Study

The increased use of technology within school systems today provides an opportunity to incorporate cooperative learning within the classroom. The purpose of this study was to determine if combining technology and cooperative learning would increase social studies content achievement compared to cooperative learning without technology and compared to a traditional method of teaching.

As Chapter II of this study shows, a number of studies compare the effects of technology with cooperative learning and technology without cooperative learning with respect to student achievement. Model 1 depicts this relationship. The constant in these studies is technology; the variable is the classroom environment, cooperative or no cooperative learning. Since many classrooms have a limited number of computers, teachers commonly use cooperative learning (more than one student working cooperatively on a computer at a time) to increase the amount of time each child spends on the computer. As a result, much research has been done to compare the results of students using computers cooperatively compared to individually (Model 1).

Model 1



There is little or no research that looks at cooperative learning with technology compared to cooperative learning without technology with respect to student achievement. Model 2 depicts this relationship. The constant in this model is cooperative learning; the variable is the use of technology, technology or no technology. If the goal of a teacher is to help a student gain the highest amount of achievement possible, it is important to know which teaching methods are the most effective at increasing student achievement. The research shows that both cooperative learning and technology can increase student achievement. The question is will the two methods together result in even higher achievement than the increased achievement that results from each method individually. This study focuses on Model 2

Model 2

CHAPTER II

Review of Literature

According to one of the leading researchers in cooperative learning, Robert Slavin (1996), "Hundreds of studies have compared cooperative learning to various control methods on a broad range of measures, but by far the most frequent objective of this research is to determine the effects of cooperative learning on student achievement."

Slavin and Stevens (1995) conducted a two-year study on the effects of cooperative learning on student achievement. Their sample included 1,012 students in grades two through six in five elementary schools in suburban Maryland. Two schools, in which 75% of the faculty agreed to participate in a wide range of cooperative learning strategies, were considered the treatment schools. Three schools that matched the treatment groups in average student achievement, ethnicity, and socioeconomic background were chosen to be the comparison schools. Twenty-one classes in the treatment schools were matched with twenty-four classes in the comparison schools on mean California Achievement Test scores for Total Reading, Total Language, and Total Mathematics.

The teachers in the treatment schools were given training in all of the cooperative-learning strategies used in the study. The comparison schools continued using their regular teaching methods and curriculum. In reading, all of the schools used a similar basal reading program, but the treatment group did not use the workbooks that came with the series. Instead, they used cooperative-learning activities. In language arts, both schools used the same program, but the treatment group used it as a supplement to the Cooperative Integrated Reading and Composition program (CIRC). In mathematics, the comparison schools used the district-adopted textbook, while the treatment group used this textbook as a supplement to the Team Assisted

Individualization-Mathematics (TAI) program. In addition to the CIRC and TAI, the cooperative learning teachers also used the following cooperative learning strategies: Jigsaw II, Teams-Games-Tournaments, and Student Teams Achievement Division.

In the spring of the first and second years of the study, the students took the reading, language, and mathematics subtests of the California Achievement Test, Form C. In an attempt to untangle the effects of schools or teachers from the effects of the treatments on student outcomes, Slavin and Stevens used a hierarchical linear model (HLM) to analyze the results of the study. HLM is a statistical method that explains the outcomes for members of groups as a function of characteristics of groups and characteristics of members (Arnold, 1992).

After the first year of the study, the only statistically significant difference between the two groups was on reading comprehension, in favor of the treatment group. After the second year of the study, there was a statistically significant difference in favor of the cooperative-learning group on reading vocabulary, reading comprehension, language expression, and math applications. Also in the second year of the study, there was a statistically significant difference in favor of the treatment group for learning disabled students on reading comprehension, language expression, math computation and math application.

For looking at the effects of cooperative learning on gifted students, an ANCOVA was used because there was a difference in initial math achievement. The first-year results showed no significant differences, but after the second year, the gifted students in the treatment group showed significantly higher scores in reading vocabulary, reading comprehension, language expression and math computation.

Sharan, Ackerman, and Hertz-Lazarowitz (1979-1980) conducted a study that compared small group, cooperative learning to whole-class instruction with respect to their effect on student

achievement. The sample in their study included ten classrooms from two elementary schools in Israel. All of the children were from homes of low socioeconomic status, and 87% of the children were from families which had come from Moslem countries of the Middle East. Five of the classes, grades two through six, in one elementary school were taught various lessons using cooperative learning. Five classes in the other elementary school were taught the same units using whole-group instruction. The cooperative-learning teachers received one-and-a-half years of training in cooperative learning before the study.

To measure the amount of achievement, the teachers in the study worked together to write a test for each unit with questions that involved both low- and high-level questions. At the beginning of the study, the students were given a test of reading comprehension to be used as a covariate in the ANOVA. At the end of the unit, the achievement test was administered. An ANOVA was used to analyze the results. In three-out-of-the-five grade levels, students in the cooperative group scored higher on the high-level questions than students in the whole-class instruction classes. Students in the second grade, cooperative classroom scored higher on both the low- and high-level questions. Two-of-the-five classes showed no significant differences on the high-level questions and four-of-the-five classes showed no significant differences on the low-level questions.

Mattingly and VanSickle (1991) studied the effect of cooperative learning on social studies achievement. The sample in the study included two ninth grade classes in a school for the children of military personnel in Germany. One class was randomly chosen to receive whole-class instruction and the other, cooperative-learning. Students in the cooperative-learning group used a cooperative-learning strategy called Jigsaw II. With this strategy, students are put into groups of five or six. Each student in the group is given a different topic and information

and then that student uses the information to teach the rest of the group. For nine weeks, students in both groups studied a unit on Asia. At the beginning of the study, students were given three pretests: a 135-item test that came with the social studies textbook, the Henmon-Nelson test, and a competency-based geography test. The purpose behind the pretests was to assess the extent to which the two classes were equivalent at the beginning of the study. The posttest used was the average of the nine chapter tests given throughout the study. The posttest scores were analyzed using a t-test of independent means. The results indicated that the achievement of the Jigsaw II group was higher compared to the whole-class instruction group; the difference was statistically significant.

Shachar and Sharan (1994) studied the effect of Group Investigation, a cooperative-learning method, on student achievement. This method involves the students working together to research a topic and present that research to the class. Shachar and Sharon's study involved 351 Jewish students from a large, junior-high school in Israel. The students in this study came from both the middle and the lower class and were from one of two ethnic groups, Western and Middle Eastern. Students were divided into nine heterogeneous classes. Five of the classes were taught with the Group Investigation method and four were taught with the traditional whole-class method.

Shachar and Sharan measured student achievement by using a history and a geography test that was designed by a group of teachers from both the cooperative-learning and the whole-class method. Identical forms of these tests were used as a pre- and posttest. Since the students' scores on both tests were similar, Shachar and Sharan reported their analysis for the history test only. One question on the history test was missed by a large number of students so it was thrown out. A 2x2x2 split design ANCOVA was used to compare the gain in mean achievement scores

of each group. Shachar and Sharon found that regardless of the students' background, the mean gain in achievement scores of every classroom taught with the Group Investigation was higher than the mean score of every class taught with the whole-class method.

Cooperative learning is often combined with technology as part of instruction. Many of the studies that look at the effect of combining cooperative learning and computers on achievement compare computer use with cooperative learning and computer use without cooperative learning. The focus of the rest of Chapter II will be on technology and its effect on student achievement with and without cooperative learning.

Johnson, Johnson, and Stanne (1986) conducted a study that compared the use of cooperative learning, competitive learning, and individualized instruction while using computer-assisted instruction. The study involved 75 eighth graders from a Midwestern, suburban, middle school. Students were randomly assigned to one of three groups. Twenty-four students were assigned to the cooperative group, twenty-six students were assigned to the competitive group, and twenty-four students were assigned to the individualistic group. Student in each group went through a ten-week unit on the fundamentals of reading a map and navigation. All three teachers were trained in cooperative, competitive, and individualistic instruction. The lessons were rotated among the teachers, with each teacher teaching one-third of each lesson in each group. The teachers worked from a prepared script. The achievement level of the students was measured by observing the number of correctly answered questions on all of the worksheets done throughout the study and through a final examination. A 3 x 2 ANOVA was used to analyze the difference between the three conditions and between male and females. The results showed that students in the cooperative-learning group completed more worksheet items than those in the other two groups. The students in the cooperative-learning group scored the highest on the final

examination. The study indicated that compared to the individualized instruction method and the competitive method, the cooperative method was more beneficial. Cooperative computer-assisted instruction promoted higher quantity and quality of daily achievement, greater mastery of factual information, and a greater ability to apply one's factual knowledge. It was also found that in the cooperative computer-assisted group, there was a greater understanding of the material by all of the students and greater retention of what they learned.

In a related study, Chernick (1990) compared the achievement of students working in a group at one computer (the interdependent group), students working on their own computer but near other students working on similar tasks (the coactive group), and students working individually on a computer. The study involved 80 students selected randomly from three third- and two fourth-grade classes in a public, elementary school in suburban New York City. Twenty of the students were assigned to the individualized instruction group and 30 students (ten groups of three) were assigned to both the coactive group and the interdependent group. (Students were assigned to heterogeneous groups based on the Test of Cognitive Skills.) Treatment for each group involved one of two software programs, Memory Castle or The Factory. Within each program, students completed tasks that were both high and low in complexity. Students completed a total of nine lessons within a three-day time period.

Student achievement was measured by observing the number of problems solved for each lesson and through a posttest. The posttest involved the students completing similar tasks on the computer individually. A 3 x 2 x 3 ANOVA was used to measure the main and interaction effects of the three trials (one each day), two levels of complexity and the three groups. Results showed that subjects working in the interdependent group correctly answered more problems during the lessons than students working individually or coactively; the difference was

significant. A second ANOVA (3 x 2) was used to analyze the results of the posttest. There was no significant difference between the groups on the posttest.

Hooper, Temiyakarn, and Williams (1993) conducted a study that compared the effect of completing computer-based instruction lessons cooperatively compared to individually with high- and average-ability students. The sample in the study consisted of 175 fourth-grade students from a predominantly white, upper-class, suburban, elementary school. Students were identified as being high or average achievers based on the mathematics section of the California Achievement Test. Within each class, students were assigned to paired or individual treatment groups. One high- and one low-achieving student were paired in the cooperative groups. Students in the cooperative group were given training in cooperation prior to the study.

During the study, students completed three different levels of a computer program that involved the students decoding symbols based on mathematics operations. At the end of each level, students had to take a mastery quiz to be able to move on to the next level. At the end of the study, students were given a posttest based on the knowledge they were to have learned from completing the computer lessons. To analyze the results, a MANOVA was used. This was used to see if high-and low-achieving students experienced different levels of achievement with respect to cooperative verses individual computer-based instruction. The results indicated that cooperative learning increased the achievement of both high- and low-achieving students.

Dalton, Hannafin, and Hooper (1989) conducted a study that looked to see if a student's academic performance was better as a result of cooperative rather than individualized computerized instruction. The subjects in this study where 60 eighth-grade students selected from two sections of a health class. The sample included 29 males and 31 females from a suburban school. Students were designated as either high or low in ability based on the

Comprehensive Tests of Basic Skills. With respect to gender and ability, students were randomly assigned to one of the two treatment groups, either cooperative computer instruction or individual computer instruction.

Each group studied a unit on human reproduction and urinary systems using 30-minute, computer-based lessons. The students in the individualized instruction group were told to complete the lesson on their own. Students in the cooperative instruction group were encouraged to work together in groups of two. The students in each group rotated between the role of communicator and recorder during the study.

At the end of the unit, the students were given a posttest that they completed individually. A 2x2x2 ANOVA was used to analyze the results. The mean test score of the cooperative group was significantly higher than that of the individual group. The cooperative group consistently yielded a superior performance across gender and ability.

Repman (1993) looked at the effects of unstructured verses structured cooperative learning groups on content area achievement while using a computer. The study involved 190 seventh-grade, social studies students from a metropolitan, public, middle school. Nine intact social studies classes were randomly assigned to one of three groups. The first group was given the computer tasks without any instructions on working together other than they were to take turns using the keyboard. The second group was given the computer tasks and assigned one of three roles: keyboarder, checker, or questioner. The third group was the same as the second group but they were also given three fifty-minute sessions of training in collaborative learning.

A pre- and posttest were used to measure the level of content-area achievement. An ANCOVA was used to measure the effects of the various treatments. The difference in mean posttest scores between groups was not significant. When the planned orthogonal contrasts were

performed, a significant difference was found in favor of the structured and training conditions when contrasted with the unstructured conditions. The study demonstrated that when students are placed in a structured collaborative group they have higher achievement than do students in a nonstructured collaborative group when working on a computer.

When looking at computer based instruction without comparing cooperative learning with traditional teaching, most of the studies compare the achievement of students using a computer for instruction to students receiving a traditional form of instruction. Hasselbring (1986) analyzed the results of research done on computer-based instruction over a twenty-year period. He concluded that overall, the research done on computer-based instruction showed that when compared to traditional teaching, students receiving computer-based instruction demonstrated equal or better achievement.

Kulik and Kulik (1991) conducted a meta-analysis of 254 studies done on computer-based instruction (CBI) and its effect on student learning. All of the 254 studies took place in an actual classroom, had quantitative results, and were free from any crippling methodological flaws. Most of the quantitative data, 248 out of the 254 studies, came from an achievement examination given at the end of each study. For statistical analysis of the data, they coded each outcome as an effect size (ES) defined as the difference between the mean scores of the two groups divided by the standard deviation of the control group. The effect size provided a common scale to use to look at the effect technology had on student achievement compared to the control group. In 81% of the 248 studies, the students in the CBI had the higher examination average compared to the conventionally taught class. The results of this meta-analysis show that the typical student in an average CBI class would perform at the 62^{nd} percentile compared to the 50^{th} percentile for students taught in a conventionally taught class.

Another meta-analysis conducted on the efficacy of computer-assisted instruction was done by Fletcher-Flinn and Gravatt (1995). They conducted an analysis of 120 studies from 1987-1992 that involved computer-assisted instruction, had quantitative results, and were free from obvious methodological flaws. The efficacy of computer-assisted instruction was measured by tests or exams given after the completion of the instruction. For the statistical analysis of the data, Fletcher-Flinn and Gravatt used four different formulas that were recommended by Glass, McGaw, and Smith (as cited in Fletcher-Flinn and Gravatt, 1995). The results showed that in the average study, students in the computer-assisted instruction group had scores .24 standard deviations higher than those of the comparison group. In terms of percentiles, students receiving computer-assisted instruction outperformed 60% of the students from conventional classes.

Ferrell (1986) studied the effect of having computers in the classroom on mathematics achievement over an entire school year. The subjects in her study were ninety-one, sixth-grade students from a large, urban school district in the Southwest. Out of four existing classes, two were randomly chosen to use computers as the main means of mathematics instruction and two of the classes were chosen to have a single teacher as the main means of mathematics instruction.

Student achievement was measured at the beginning of the year by using the Iowa Test of Basic Skills. Students, for the most part, were scoring at or just below grade level. The same test was then given to the students at the end of the year. An ANCOVA was used to analyze the results of the study. The results of the ANCOVA showed a significant difference between the mean scores of the two groups in favor of the computer instruction.

Fletcher, Hawley, and Piele (1990) looked at the effects of using computer instruction on students' mathematics achievement. The sample in their study involved two third-grade classes and two fifth-grade classes from a single school in rural Saskatchewan, Canada. Classes at each

grade were divided into a traditional mathematics instruction group and a group that received instruction using Milliken Math Sequences software.

At the beginning of the study, all of the students were given a pretest. The test used was the Canadian Test of Basic Skills. The study lasted 71 school days. At the end of the study, the students were given the same test as a posttest. An ANCOVA was used to analyze the results of the pre- and posttest. Students using the computer scored significantly higher than the students that received traditional instruction.

This chapter has presented the research that shows that cooperative learning increases student achievement and using computer-based instruction increases student achievement. This chapter also has demonstrated that when these methods are combined there is an increase in student achievement. What is not available in the research is whether combining cooperative learning and computer-based instruction will result in higher achievement than to cooperative learning by itself.

CHAPTER III

Method

Sample

The subjects in this study were from a suburban public school system in a small Midwestern city. The minority student population of the school was 7.4%. The city had a 6.1% minority population (U.S. Department of Commerce). The average, annual income of this school system was $29,000. The study involved 49 third graders from a single elementary school. Sixty percent of the students in this study received free or reduced lunch and 9%of the students where minorities.

Procedure

Students in this study were originally assigned to one-of-three third-grade classes by the second-grade teachers on the basis of creating classes that were heterogeneous in ability, race, and gender. For this study, each of the three classes was assigned to one of three groups: the cooperative-learning-and-technology group, the cooperative-learning-no-technology group, and the traditional-learning group. Members of cooperative-technology group were so assigned because they had easier access to the technology. The cooperative-no-technology and the traditional-learning groups were assigned randomly by the flip of a coin.

A pretest-posttest procedure was used. A posttest, identical to the pretest, was administered after the treatment (APPENDIX A). Both tests were part of the Silver Burdett & Ginn (Loftin & Ainsley, 1988) social studies teacher's manual.

Students in both cooperative-learning groups were divided into research groups. The cooperative-technology group had three students in each research group. A group size of three was selected since it has been found that it provides an opportunity for peer interaction while

being small enough to afford each member physical access to the computer (Chernick 1990). The cooperative-no-technology group, with 15 students, had three groups with two students and three groups with three students. Students in the cooperative-technology group had already had some experience with the technology having created their first video two months before this study.

Based on the research of Becker (1992), the cooperative-learning activity combined group rewards with individual accountability. At the end of each day of working on this project the group had to report to the teacher with at least one task that each student had done that day. The groups that showed an equal distribution of the work were rewarded with verbal praise and classroom money. To incorporate the cooperative-learning component of individual accountability into the study, a student who did not do his/her share of the work was fined classroom money, temporarily removed from the group, and/or had his/her grade lowered.

Modeled after the Group Investigation method (Sharon and Sharon 1994), each group was given a different part of a unit on "Resources for our Community" (Loftin & Ainsley, 1988) to research and prepare a presentation to use to teach this part of the unit to the class. To help the students with their research, they were given a list of questions to answer about their specific topic (Appendix B). The cooperative-no-technology and the cooperative-technology groups used the textbook as their primary source of information. This was necessary to ensure that all three groups were getting the same information. The cooperative-no-technology group used reference books from the library as a supplement to the textbook and the cooperative-technology group used reference books on CD-ROM as a supplement to the textbook. The cooperative-technology group was encouraged to find, not only written information, but multimedia materials as well.

Once the research was completed, each group had to decide the best way to present its information. The cooperative-no-technology group created posters, other visual aids, and the cooperative-technology group created a video on the topic. To create the video the students used a multimedia, 133Mhz, 16MB, 1.3GB P.C. equipped with a Miro Digital Editing System, a small color television, and two 4-head VCRs. On the computer, students used Microsoft PowerPoint and Adobe Premiere LE to put the video together. When each video was finished the teacher combined the individual videos into one on the entire unit. Table 1 clarifies this implementation plan.

Table 1

Work Methods of the Three Groups

Group	Research Method	Presentation Method
Cooperative-Technology	textbook and reference books on CD ROM	student created videos
Cooperative-No–Technology	textbook and reference Books	posters, pictures, and hand-made props
Traditional	Textbook	teacher presentation

As part of the Group Investigation method, students in the cooperative-technology group used their videos to present the information to the class. The cooperative-no-technology group presented the information using visual aids. In both cases, the students were informed that they would be tested on this information and to make sure if they did not understand something, to ask the members of the group. Each group submitted two quiz questions based on its

presentation. The quiz questions were combined into one quiz and that quiz was administered after all of the presentations were completed. (This quiz should not be confused with the posttest; it was part of the group investigation method. It provides an incentive for children to listen to each other.) The traditional learning group studied the material through teacher lectures and completing the assigned worksheets that came with the social studies unit. This group did not take the quiz (Table 1).

The pretest was administered to all three groups on the day before starting the social studies unit. The posttest was administered 16 days later, the day after the unit was completed. The students worked on the unit for twelve school days. All three groups took the pretest and posttest on the same day. (One student in each group did not take the posttest due to being absent from school.) To determine whether one treatment resulted in significantly higher social studies scores on the posttest compared to the other treatments an ANCOVA was used. Five questions on the test were not included in the analysis of the pre-and posttest because that information was not available to all of the students.

Null Hypothesis

Third-grade students using computer and technology in a cooperative learning environment will score the same on the unit test compared to third-grade students in a cooperative learning environment without technology and compared to students in a traditional learning group.

Definitions

Technology is defined as using a computer to access various multimedia CD ROMs to get information and then organize that information and multimedia into a video presentation.

Cooperative learning is defined as the Group Investigation method (Sharan and Sharan 1992). This method involves small groups of students working together to research the answers to questions and then presenting their information to the class.

Traditional model of instruction is defined as having the students read the assigned material, complete worksheets based on the reading, and listen to the teacher describe what they have read.

CHAPTER IV

Results

Description Findings

Of the total 49 students at the onset of the study, 46 completed the project. Twenty-one were males and 25 were females. The cooperative-technology group consisted of 17 students, 47% female and 53% male. Three of the students had a verified learning disability and were receiving special services. The cooperative-no-technology group had 14 students, 57% female and 43% male. This group did not have anybody receiving special services. The traditional-instruction group had 15 students, 60% female and 40% male. One student was receiving special services due to a verified learning disability. (See Table 2.)

Table 2

Group Descriptions

	Males		Females	
Group	Number	Special Services	Number	Special Services
Total	21	0	25	4
Cooperative, Technology	9	0	8	3
Cooperative, No-Technology	6	0	8	0
Traditional Instruction	6	0	9	1

Pretest and Posttest Results

There was a total of 18 possible points on the pretest and posttest. There was only a slight difference in the mean test scores of the three groups in both the pretest and posttest (Table 3). The standard deviations of the three groups only differed by 1.25 standard deviations between the highest standard deviation of 3.04 and the lowest standard deviation of 1.79. The mean pretest and posttest scores for male students were slightly higher than the female students'

mean test scores. Compared to the male students, the female students had a higher mean difference between the pre- and posttest.

Table 3

Pre- and Posttest Scores

Group	Pretest		Posttest		Difference in Pre-Posttest Scores	
	Mean	S.D.	Mean	S.D.	Mean	S.D.
Total	9.17	2.54	15.17	1.74	6.00	2.50
Male	9.90	2.53	15.43	1.89	5.52	2.46
Female	8.56	2.43	14.96	1.62	6.40	2.52
Special Services	6.25	0.96	14.50	2.38	8.25	3.10
Cooperative-Technology	9.00	2.83	15.35	1.84	6.35	3.04
Male	10.00	3.04	16.00	1.80	6.00	2.69
Female	7.88	2.23	14.63	1.69	6.75	3.54
Special Services	6.00	1.00	15.67	0.58	9.67	1.53
Cooperative-No-Technology	9.29	1.73	15.14	1.70	5.86	1.79
Male	10.17	1.60	15.17	2.14	5.00	2.10
Female	8.63	1.60	15.13	1.46	6.50	1.31
Traditional-Instruction	9.27	2.96	15.00	1.77	5.73	2.52
Male	9.50	2.81	14.83	1.83	5.33	2.73
Female	9.11	3.22	15.11	1.83	6.00	2.50
Special Services	7	0	11	0	4	0

ANCOVA Results

To determine if one treatment resulted in higher achievement, as measured by test scores, compared to the other treatments an ANCOVA was used. Table 4 identifies the results from the analysis. Based on this information there was no significant difference ($p=.768$) between the three treatment groups. Only 8% of the differences in achievement levels among the groups can be attributed to the treatment. However, the data show that the covariate used was significant ($p=.013$) in adjusting for initial differences of the students.

Table 4

ANCOVA Results

F Prob.	Adjusted R^2	Covariate Prob.
.768	.082	.013*

* significant at .05 level of probability

Discussion of Findings

The results of this study show that it is not possible to reject the null hypothesis. This result is not consistent with the previous research that shows using cooperative learning results in higher student achievement. There are three main differences between this study and the research in Chapter II. Many of the studies (Sharan, Ackerman, and Hertz-Lazarowitz, 1979-1980, and Johnson, Johnson, and Stanne, 1986) had special training for the teachers involved in the study, while in this study, the teacher had limited training in cooperative learning.

Another difference between this study and the studies in Chapter II is the duration of the study. Slavin and Stevens's (1995) study lasted for 2 years. They did not see significant results until the second year. Ferrell's (1986) study lasted one year and Fletcher, Hawley, and Piele's (1990) study lasted 71 days. Mattingly and VanSickle (1991), and Johnson, Johnson, and Stanne (1986) conducted studies that lasted 9-10 weeks. The duration of this study was only 12 school days.

A third difference between some of the research and this study is the use of structure. Repman's (1993) study showed that cooperative groups that are structured have higher achievement compared to cooperative groups that are unstructured. Repman (1993) and Dalton, Hannafin, and Hooper (1989) assigned specific roles to the students. The only structure given to the groups in this study was that they were to take turns and try to divide the parts equally.

CHAPTER V

Summary, Limitations, and Implications

Summary

Research has shown that cooperative learning and computer-based instruction are two teaching methods that can be used to increase student achievement. Most of the research that combines cooperative learning and computer-based instruction compares computer-based instruction with cooperative learning to computer-based instruction without cooperative learning. Little or no research looks at cooperative learning with technology compared to cooperative learning without technology with respect to student achievement. The purpose of this study was to determine if combining technology and cooperative learning would increase social-studies-content achievement compared to cooperative learning without technology and compared to a traditional method of teaching.

The study involved 49 third graders working in one of three groups, the cooperative-technology group, the cooperative-no-technology group, or the traditional-learning group. Students studied a unit on Our Nation's Resources. Based on a cooperative-learning method called Group Investigation, the two cooperative-learning groups researched specific parts of the unit and then presented their information to the rest of the class. Students in the cooperative-technology group used the textbook and multi-media CD ROMs to research their topic. They then used a computer to present their information. Students in the cooperative-no-technology group used the textbook and encyclopedias to research their topics and then prepared oral presentations for the class.

The null hypothesis was third-grade students using computer and technology in a cooperative-learning environment would have the same mean score on the unit test compared to

third grade students in a cooperative learning environment without technology and compared to students in a traditional learning group.

A pretest-posttest procedure was used to measure student achievement. An ANCOVA was used to determine if there was a significant difference in the scores of each treatment group. There were 16 days between the pretest and the posttest. The results of the ANCOVA indicate that there was not a significant difference between the groups with respect to their test scores. Therefore, the null hypothesis was not rejected.

Limitations of Present Study

The limitations of this study may be responsible for the lack of a significant difference between the treatment groups. This study involved a small number of students. There were only an average of 16 students in each group and one student in each group did not finish the study due to being absent from school.

The test used for the pretest and the posttest was based on the information in the textbook. Therefore, it was designed to favor the traditional group by presenting the information in a form the resembled the assigned worksheets and textbook information. The test did not include the additional information that the two cooperative-learning groups were able to uncover about the topic. Having specific facts that had to be presented limited what the cooperative-learning groups could do with their research and their presentations.

Having a limited amount of time hurt the cooperative-technology group. Since the students had access to only one computer, each group did not have enough time to use the technology as effectively as they could have. Being third graders, they needed more time to learn how to use the computer and then decide the most effective way to use it to present their

information. Students were also limited in what they were able to do with their video due to a lack of hard-drive space.

Having a limited amount of time hurt both cooperative groups because they had to rush through their presentations and did not have enough time to interact with their classmates following their presentation. The discussion time after the presentations is an essential component of the Group Investigation method (Sharon and Sharon 1992).

Implications

Since there is little research on this topic, this study needs to be repeated but with a larger sample and over a longer time period. It would also be helpful to see if there would be different results if this study were conducted with older students who have more experience with the technology. This study looked at the short-term effect the different teaching methods had on student achievement. It would be interesting to see what would happen if the test was given two or three months later. An effort was made to separately study the students who were receiving special services, however the subsample was too small to analyze. The results seem to indicate that combining cooperative learning and technology can increase the achievement of students who receive special services. A related study should be conducted with a higher population of students receiving special services in each group. It would also be helpful to look at the effect these methods have on student achievement in other subjects as well as student attitudes towards learning.

APPENDIX A

Pre- and Posttest

Name _____

Date _____ Score _____

SILVER BURDETT & GINN SOCIAL STUDIES

Part A / Multiple Choice

There are four choices for each of the following test items. Each choice has a letter in front of it. Fill in the answer space that has the same letter as the answer that you picked.

1. A dark liquid that makes energy in the form of heat is (a) petroleum (b) coal (c) copper (d) bauxite. (p. 157)	1. ⓐ ⓑ ⓒ ⓓ
2. A form of energy that gives light and heat is (a) gold (b) electricity (c) iron (d) moon rock. (p. 158)	2. ⓐ ⓑ ⓒ ⓓ
3. Petroleum is usually called (a) coal (b) gas (c) ore (d) oil. (p. 157)	3. ⓐ ⓑ ⓒ ⓓ
4. Oil is used to make (a) asphalt (b) food (c) steel (d) crops. (p. 158)	4. ⓐ ⓑ ⓒ ⓓ
5. A steel tower used to hold drilling equipment is called a (a) bit (b) drill (c) pipe (d) derrick. (p. 161)	5. ⓐ ⓑ ⓒ ⓓ
6. An oil pipeline has been built across (a) New York (b) Iowa (c) Alaska (d) Texas. (p. 163)	6. ⓐ ⓑ ⓒ ⓓ
7. Much of the oil that the United States buys comes from (a) Canada (b) Saudi Arabia (c) China (d) England. (p. 163)	7. ⓐ ⓑ ⓒ ⓓ
8. Oil is called a nonrenewable resource because it (a) comes from the ground (b) is hard to find (c) cannot be replaced (d) is not pure. (p. 158)	8. ⓐ ⓑ ⓒ ⓓ
9. Oil is changed into different products at a(a) creamery (b) derrick (c) pipeline (d) refinery. (p. 162)	9. ⓐ ⓑ ⓒ ⓓ
10. Oil is brought to the United States on large ships called (a) tankers (b) pipelines (c) refineries (d) offshore platforms. (p. 163)	10. ⓐ ⓑ ⓒ ⓓ

11. The leading producer of coal in the United States is (a) Texas (b) West Virginia (c) Pennsylvania (d) Kentucky. (p. 165) — 11. ⓐ ⓑ ⓒ ⓓ

12. A black rock that can be burned to make energy in the form of heat is (a) coal (b) petroleum (c) copper (d) bauxite. (p. 164) — 12. ⓐ ⓑ ⓒ ⓓ

13. A harbor is important to a fishing community because (a) it keeps the fishing boats safe from storms (b) its water is shallow (c) a fishing crew can swim in it (d) fish in it are easy to catch. (p. 167) — 13. ⓐ ⓑ ⓒ ⓓ

14. Trash in our oceans and rivers makes waters (a) warmer (b) polluted (c) healthy (d) clearer. (p. 170) — 14. ⓐ ⓑ ⓒ ⓓ

15. The good use of natural resources is called (a) pollution (b) exploration (c) conservation (d) mining. (p. 170) — 15. ⓐ ⓑ ⓒ ⓓ

16. A group of people picked to make laws for the United States is called the (a) delegates (b) company (c) Congress (d) Supreme Court. (p. 173) — 16. ⓐ ⓑ ⓒ ⓓ

17. A national forest belongs to (a) the President (b) the Congress (c) the rangers (d) all the people. (p. 173) — 17. ⓐ ⓑ ⓒ ⓓ

18. Thousands of salmon are born each year in (a) greenhouses (b) creameries (c) hatcheries (d) rodeos. (p. 175) — 18. ⓐ ⓑ ⓒ ⓓ

19. Salmon are helped to swim upstream by (a) lobster pots (b) pipelines (c) canals (d) fish ladders. (p. 175) — 19. ⓐ ⓑ ⓒ ⓓ

20. The Columbia River flows between Oregon and (a) Texas (b) California (c) Washington (d) Nebraska. (p. 174) — 20. ⓐ ⓑ ⓒ ⓓ

21. Name three ways to transport oil. **(a)** airplane, sailboats, and cars. **(b)** pipelines, trucks, and tankers. **(c)** derricks, refineries, and platforms. **(d)** trucks, boats, and airplanes.	21. (a) (b) (c) (d)
22. Fishermen catch lobster with a **(a)** lobster hatchery **(b)** lobster net **(c)** lobster pot **(d)** lobster pole	22. (a) (b) (c) (d)
23. What is not the job of a ranger? **(a)** take care of the national forest **(b)** decide which trees to cut down **(c)** arrest people who steal from a store **(d)** put out forest fires	23. (a) (b) (c) (d)

APPENDIX B

Outline of Questions for Cooperative Learning Groups

I. RESOURCES FOR OUR COMMUNITY

A. Petroleum
   1. What is petroleum?
   2. What is another name for petroleum?
   3. What are some of the uses for petroleum?

B. Finding oil and Transporting oil
   1. What is a derrick?
   2. Where does the U.S. buy most of its oil?
   3. What is an oil pipeline and where has the U.S. built one?
   4. What is a tanker?

C. Coal
   1. What is coal?
   2. What state is the leading producer of coal?
   3. What is coal used for?

D. Lobsters
   1. How do fishermen catch lobsters?
   2. Why is catching lobsters important to a community?
   3. Why is a harbor a good place to catch lobsters?

E. Salmon
   1. What is a salmon?
   2. What does a salmon do to lay its eggs?
   3. What is a fish ladder?
   4. What is a fish hatchery?
   5. Why is catching salmon important to a community?

F. National Forest?
   1. What is a national forest and why do we have them?
   2. What part of the government made the national forests?
   3. What does a ranger do?
   4. Who owns the national forests?

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